UNITED STATES PATENT AND TRADEMARK OFFICE

UNITED STATES DEPARTMENT OF COMMERCE
United States Patent and Trademark Office
Address: COMMISSIONER FOR PATENTS
P.O. Box 1450
Alexandria, Virginia 22313-1450
www.uspto.gov

APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
10/040,017	01/04/2002	Mischa Megens	1-10-5	8821

47394 7590 03/26/2007

HITT GAINES, PC
LUCENT TECHNOLOGIES INC.
PO BOX 832570
RICHARDSON, TX 75083

EXAMINER	
ANGEBRANNDT, MARTIN J	
ART UNIT	**PAPER NUMBER**
1756	

SHORTENED STATUTORY PERIOD OF RESPONSE	NOTIFICATION DATE	DELIVERY MODE
2 MONTHS	03/26/2007	ELECTRONIC

Please find below and/or attached an Office communication concerning this application or proceeding.

If NO period for reply is specified above, the maximum statutory period will apply and will expire 6 MONTHS from the mailing date of this communication.

Notice of this Office communication was sent electronically on the above-indicated "Notification Date" and has a shortened statutory period for reply of 2 MONTHS from 03/26/2007.

Notice of the Office communication was sent electronically on above-indicated "Notification Date" to the following e-mail address(es):

docket@hittgaines.com

UNITED STATES PATENT AND TRADEMARK OFFICE

Commissioner for Patents
United States Patent and Trademark Office
P.O. Box 1450
Alexandria, VA 22313-1450
www.uspto.gov

BEFORE THE BOARD OF PATENT APPEALS AND INTERFERENCES

Application Number: 10/040,017
Filing Date: January 04, 2002
Appellant(s): MEGENS ET AL.

Ronald J. Corbett (47,500)
For Appellant

EXAMINER'S ANSWER

This is in response to the appeal brief filed December 4, 2006 appealing from the Office action mailed October 20, 2006.

(1) Real Party in Interest

A statement identifying by name the real party in interest is contained in the brief.

The examiner is not aware of any related appeals, interferences, or judicial proceedings which will directly affect or be directly affected by or have a bearing on the Board's decision in the pending appeal.

(3) Status of Claims

The statement of the status of claims contained in the brief is correct.

(4) Status of Amendments After Final

No amendment after final has been filed.

(5) Summary of Claimed Subject Matter

The summary of claimed subject matter contained in the brief is correct.

The examiner notes that the applicant refers to the relevant sections of the Prepublication of the instant specification (2003/0129501), rather than the pages and lines of the specification itself.

(7) Claims Appendix

The copy of the appealed claims contained in the Appendix to the brief is correct.

(8) Evidence Relied Upon

4,402,571	Cowan et al.	09/1983
5,639,802	Neckers et al.	06/1997
6,115,152	Popovich et al.	09/2000
WO99/62460	Oxman et al.	12/1999

Campbell, M., et al., "FAbrication of Phtonic crystals for the visible spectrum by holographic lithography", Nature vol. 404, pp. 63-56 (March 2, 2000).

Turberfield, A.J., et al., "Photonic Crystals made by Holographic lithography", MRS Bull., pp. 632-636 (August 2001).

(9) Grounds of Rejection

The following ground(s) of rejection are applicable to the appealed claims:

Rejection I. (brief at pages 9-15)

Claims 1-10,14-20,22-23 and 26-29 are rejected under 35 U.S.C. 103(a) as being unpatentable over **either** Campbell, et al., "Fabrication of Photonic Crystals for the Visible Spectrum by Holographic Lithography, Nature, Vol. 404. pp. 53-56 (03/2000) **or** Turberfield, "Photonic Crystals made by Holographic Lithography, MRS Bull. Pp. 632-636 (08/2001), in view of Popovich et al. '152, Neckers et al. '802 and Oxman et al. WO99/62460

Campbell, et al., "Fabrication of Photonic Crystals for the Visible Spectrum by Holographic Lithography, Nature, Vol. 404. pp. 53-56 (03/2000) teach the use of an Epoxy based resist EPON SU8, with a triarylsulfonium salt as the photoinitiator/photoacid generator.

The resist is coated on a substrate 10-60 microns thick, heated to remove the solvent, exposed to four beams at 355 nm with a 6 ns pulse at 80-200 mJ/cm^2 (this yield and exposure of 1.3×10^{11} to 3×10^{12} mW/cm^2). "absorption of the UV photon by the molecule of PAG liberates a hydrogen ion; acid catalyzed polymerization occurs when the film is heated in a post-exposure bake". The photonic crystal structure is revealed by development using propylene glycol methylether acetate in an ultrasonic bath. (page 54). The formation of full connected polymer and air void lattices is disclosed. The filling of the resultant structure with titania is disclosed. (page 54,right column).

Turberfield, "Photonic Crystals made by Holographic Lithography, MRS Bull. Pp. 632-636 (08/2001) teaches the use of an Epoxy based resist EPON SU8, with a triarylsulfonium salt as the photoinitiator/photoacid generator. The resist is coated on a substrate, heated to remove the solvent, exposed to four beams. "absorption of the UV photon by the molecule of PAG liberates a hydrogen ion; acid catalyzed polymerization occurs when the film is heated in a post-exposure bake". The photonic crystal structure is revealed by development using propylene glycol methylether acetate in an ultrasonic bath. (page 633, right column). The formation of full connected polymer and air void lattices is disclosed. (page 634, center column). The filling of the resultant structure with titania is disclosed. (page 635, left column). The use of three beam exposure is disclosed. (page 625, left column).

Popovich et al. '152 teach the use of eosin and triethanol amine, fluorescein and triethanolamine, erythrosin B and triethanol amine systems as initiation systems extending spectral response of photopolymerizable systems into the 400 – 700 nm range. (These are all xanthene dyes, see prepub of the instant specification at [0040] and figures 4a-c)) The use of

triethylamine and other amines as co-initiators is disclosed. (8/35-9/6). The formation of gratings using 488 nm lasers is disclosed. The thickness of the photocurable composition can be 15-100 microns (8/25-34) and are exposed at 0.1-100mW/cm^2 for 30-120 seconds (yielding 3 – 12,000 mJ/cm^2) .

Neckers et al. '802 in example 1 which comprises cyclohexene oxide (an epoxy), ethyl erythrosine (a xanthene dye), diaryliodonium hexafluoroantimonate and pentamethylaniline. When exposed to visible light 10 minutes are required for curing. Amines useful as coinitiators with onium salts are disclosed. (10/47-11/18). The use of these with novolak/Novolac resins is disclosed. (11/49-65). Thicknesses of 10 mil are cured in the examples (254 microns) with exposures of 50 to 400 mW/cm^2 for 60 seconds (yielding 3000-24000 mJ/cm^2)

Oxman et al. WO99/62460 in examples 1-21 teach a mixture of acrylates and epoxy curable materials, together with diaryliodonium hexafluoroantimonate, camphorquinone, polytetrahydrofuran together with 22 different cationic polymerization modifiers. Example 5 uses 2,4,6-pentamethylaniline, example 6 used dimethylbenzylamine, example 13 used ethanolamine and example 10 uses triethylamine and the induction periods (the difference between T_3 and T_2 (control)) were determined . (page 25-30). For examples 5,6,10 and 13, the induction period raged from 0.51-3.46 minutes depending upon the amount and polymerization modifier used. (table 1 on page 29). The exposure was in the 400-500 nm range (22/22-26). Useful sensitizers include xanthene dyes (page 12/lines 1-13). Of the cationic polymerization modifiers listed on page 10, methyldimethanolamine, dibutylamine, diethanol amine, ethylemorpholine, (methylamino)ethanol and dimethylbenzylamine also increase the rate of

polymerization once it begins. The intensity is 200-400 mW/cm^2 for 5-10 seconds (yielding 1000-4000 mJ/cm^2) (page 9/lines 6-12).

It would have been obvious to one skilled in the art to modify the compositions and processes of **either** Campbell, et al., "Fabrication of Photonic Crystals for the Visible Spectrum by Holographic Lithography, Nature, Vol. 404. pp. 53-56 (03/2000) **or** Turberfield, "Photonic Crystals made by Holographic Lithography, MRS Bull. Pp. 632-636 (08/2001) which use sulfonium salts by using dye/onium together with amine coinitators/polymerization modifiers to extend the spectral response of these compositions and control the rate and onset of polymerization as disclosed by Neckers et al. '802 and Oxman et al. WO99/62460 and to use a longer wavelength laser, such as the 488 nm output of an argon ion laser to perform the interferometric exposure as taught by Popovich et al. '152, which has the benefit of the laser beams being visible to the eye, which allows easy adjustment of the laser beams.

Rejection II. (brief at 15-21)

Claims 1-10,14-20,22-23 and 26-29 are rejected under 35 U.S.C. 103(a) as being unpatentable over **either** Campbell, et al., "Fabrication of Photonic Crystals for the Visible Spectrum by Holographic Lithography, Nature, Vol. 404. pp. 53-56 (03/2000) **or** Turberfield, "Photonic Crystals made by Holographic Lithography, MRS Bull. Pp. 632-636 (08/2001), in view of Popovich et al. '152, Neckers et al. '802 and Oxman et al. WO99/62460, further in view of Cowan et al. '571.

Cowan et al. '571 teach the use of argon ion lasers and HeCd lasers (458 and 442) when forming crossed grating patterns to form 2D arrays of features.

In addition to the basis provided above, the examiner cites Cowan et al. '517 to support the position that the use of visible lasers in place of the UV lasers used in the exposure processes of **either** Campbell, et al., "Fabrication of Photonic Crystals for the Visible Spectrum by Holographic Lithography, Nature, Vol. 404. pp. 53-56 (03/2000) **or** Turberfield, "Photonic Crystals made by Holographic Lithography, MRS Bull. Pp. 632-636 (08/2001) as modified by of Popovich et al. '152, Neckers et al. '802 and Oxman et al. WO99/62460 would have been obvious and furthermore the use of visible lasers to expose resists twice to form arrays of features is old and well known in the holographic arts.

The rejection stands for the reasons above without further comment.

(10) Response to Argument

Section C on pages 9-14 of the brief is understood to correspond to Rejection I. The reference to Cowan in this section appears to be inadvertent (cut and paste artifacts) and are repeated in section D (pages 15-21 of the brief), so this does not appear to warrant requiring the appellant to re-write the appeal brief.

Section C.a.-C.b. (brief at 9-11)

The appellant asserts on page 9 that the examiner has not properly articulated the rejection, nor provided an early and full account of the issues for the applicant to develop a reply. The examiner disagrees with this position and has considered the application and the claims of the appellant thoroughly. The examiner has clearly articulated that the primary reference (**either**

Campbell, et al., "Fabrication of Photonic Crystals for the Visible Spectrum by Holographic Lithography, Nature, Vol. 404. pp. 53-56 (03/2000) **or** Turberfield, "Photonic Crystals made by Holographic Lithography, MRS Bull. Pp. 632-636 (08/2001)) fail to teach the neutralizer molecules (amines) or the use of spectral sensitizers, but do teach the processing steps (exposure using three laser beams and heating) as well as the photoacid generators (sulfonium salts) and the cationically curable materials (EPON SU8) which cure to polymers and in forming polymers change there refractive index. One skilled in the art would note that the steps are those recited in the claims, the cationically polymerizable materials is the same as used by the applicant (prepub at [0039]) and the photoiniator is a onium salt (sulfonium) as is the iodnium salt disclosed in the prepub of the instant application at [0043].

The rejection provides motivation to add spectral sensitizers by relying upon Popovich et al. '152 and Neckers et al. '802, where Popovich et al. '152 establishes the use of xanthene dyes, such as Rose Bengal dyes (see prepub of the instant specification at [0040]) together with amine as co-initiators for free radically polymerizable materials in the holographic arts and their effect in extending the spectral response of the photocurable composition into the visible spectrum, specifically 400-700 nm. (8/35-56). The effect of amine on controlling the rate of reaction for free radically polymerizable species is also disclosed (8/57-59). This establishes that the use of the xanthene dye/ amine co-initiator is know in the holographic arts and that spectral sensitization in the holographic art is know to be desirable.

Neckers et al. '802 is used in the rejection to establish a reasonable expectation that the sensitizing combination of the xanthene dye with the amine would be expected to spectrally sensitize cationically curable materials, and specifically onium photoinitiators. Neckers et al.

'802 in example 1 demonstrates this with the onium salt being an iodonium salt (see prepub of the applicant's disclosure at [0043], the amine being 2,4,6-pnetamethylaniline (see claim 29 and prepub at [0057]) and the xanthene dye being erythrosine. The Neckers et al. '802 reference shows various xanthene dyes in columns 5-8, including Rose Bengal (5/44-45), and describes onium photoinitiators such as sulfonium and iodonium salts (8/59-10/46) and their use with amine co-initiators (10/47-51) and **provides a reasonable expectation of success in using xanthene dyes with amine co-initiators of Popovich et al. '152 to sensitize cationic polymerization with onium salt initiators**. Without this reference there could be a doubt raised as to if the xanthene dye/amine combination would effectively spectrally sensitize onium salts to facilitate cationic polymerization as specifically address the requirements of claim 19 which recites a "photosensitizer" and claims 22,23,26 and 27 which require sensitivity into the visible.

Oxman et al. WO99/62460 addresses the effects of adding the amine to cationically curable compositions, specifically the induction period. This reference goes beyond the reasonable expectation of success and addresses the issue of inhibition of the polymerization by the amine (neutralizer molecule in the parlance of the claims) as recited in the claims and discussed in specification (see prepub of the instant specification at [0057]). The addresses what the applicant holds to be an unobvious result and further serves to establish the effectiveness of the amines discussed by Popovich et al. '152 as a co-initiator for cationically curable systems.

On this basis the examiner holds that these rejections found in the rejection of 12/07/05 are clear and evidence a nuanced understanding of the claimed invention including the benefits/unexpected results ascribed to the composition by the applicant.

On page 10, the applicant repeats claim 1 and states that the examiner has not met his burden as discussed above, the examiner has carefully chosen the references and applied them properly. The applicant argues impermissible hindsight as discussed in a previous office action, the examiner can only perform his or her job **after** the applicant has filed the application. In response to applicant's argument that the examiner's conclusion of obviousness is based upon improper hindsight reasoning, it must be recognized that any judgment on obviousness is in a sense necessarily a reconstruction based upon hindsight reasoning. But so long as it takes into account only knowledge which was within the level of ordinary skill at the time the claimed invention was made, and does not include knowledge gleaned only from the applicant's disclosure, such a reconstruction is proper. See *In re McLaughlin*, 443 F.2d 1392, 170 USPQ 209 (CCPA 1971).

Section C.1. (brief at page 11-12)

The question is that of the examiner using impermissible hindsight, which is intertwined with the issue of the lack of motivation to combine the references asserted on pages 11-14 of the brief. The applicant argues that there is no motivation to modify the invention of **either** Campbell, et al., "Fabrication of Photonic Crystals for the Visible Spectrum by Holographic Lithography, Nature, Vol. 404. pp. 53-56 (03/2000) **or** Turberfield, "Photonic Crystals made by Holographic Lithography, MRS Bull. pp. 632-636 (08/2001) to use visible light, rather than UV (Brief at page 11-12)

The applicant argues that the modification does not make sense as the resist needs to have a low absorption at the exposure wavelength to form the desired structures through the

depth/thickness of the resist (page 12, section C.1.) and There is no indication that there is any difficultly in adjusting the beams apparent in **either** Campbell, et al., "Fabrication of Photonic Crystals for the Visible Spectrum by Holographic Lithography, Nature, Vol. 404. pp. 53-56 (03/2000) **or** Turberfield, "Photonic Crystals made by Holographic Lithography, MRS Bull. pp. 632-636 (08/2001).

The issue of penetration depth raised by the applicant is not a problem and evidence on the record supports this position. Campbell, et al., "Fabrication of Photonic Crystals for the Visible Spectrum by Holographic Lithography, Nature, Vol. 404. pp. 53-56 (03/2000) teaches thicknesses of 10-60 microns and exposure through the thickness. The examiner notes that Popovich et al. '152 teach thickness of 15-100 microns in forming a PDLC hologram and Neckers et al. teaches 10 mil (254 microns) thicknesses cured by the exposure, so the absorption by the resist composition is not an issue. The examiner notes the 80-200 mJ/cm^2 exposure used by Campbell, et al., "Fabrication of Photonic Crystals for the Visible Spectrum by Holographic Lithography, Nature, Vol. 404. pp. 53-56 (03/2000) and that the 3000-24000 mJ/cm^2 exposure used by Neckers et al. '802 is higher, but holds the 60 second exposure of Neckers et al. '802 is not very long and certainly not sufficient to offset the benefit of being able to actually see the beams when performing the alignment and exposure. Neckers is the best of the secondary references for comparison with the exposure conditions of Campbell, et al., "Fabrication of Photonic Crystals for the Visible Spectrum by Holographic Lithography, Nature, Vol. 404. pp. 53-56 (03/2000) on the basis of these both being cationically curable compositions sensitized by onium salts. Further, the examiner holds the benefit of being able to see what you are working upon to be self-evident. The benefit of spectral sensitization in general is articulated in the

holographic arts by Popovich et al. '152 and is also described by Neckers et al. '802 for cationically photocurable materials. Further as discussed above, Neckers et al. '802 provides a basis for a reasonable expectation of success in having the xanthene/amine system to spectrally sensitize onium salts for cationic photopolymerization. Further, the claims embrace embodiments using a photosensitizer as evidenced by claims 17,19,22,23 and 26-27 and so the appellant's argument should not lead the board to the assumption that sensitizers are not used or embraced by the scope of the claims.

Sections C.2.-C.4. (brief at pages 12-14)

The applicant argues that there is no motivation to modify the teachings of **either** Campbell, et al., "Fabrication of Photonic Crystals for the Visible Spectrum by Holographic Lithography, Nature, Vol. 404. pp. 53-56 (03/2000) **or** Turberfield, "Photonic Crystals made by Holographic Lithography, MRS Bull. Pp. 632-636 (08/2001)) to use the co-initiator of Popovich et al. '152 (brief at pages 12-13, section C.2.), the co-initiator of Neckers (brief at page 13, section C.3.) or the modifier of Oxman (brief at page 14, section C.4.). **These arguments are treated together as the co-initiators and modifiers are the same compounds.**

The examiner response to these arguments that the rejections render obvious the addition the combination of the xanthene dye and co-initiator to the compositions of **either** Campbell, et al., "Fabrication of Photonic Crystals for the Visible Spectrum by Holographic Lithography, Nature, Vol. 404. pp. 53-56 (03/2000) **or** Turberfield, "Photonic Crystals made by Holographic Lithography, MRS Bull. Pp. 632-636 (08/2001), not merely the co-initiator/modifier. The benefit is the spectral sensitization and the effect of the amine as a co-initiator. The synergy between the xanthene and amine in initiating photopolymerization is discussed in Popovich et al.

'152 which describes this combination in the holographic arts and the Neckers et al. reference provides a basis for the expectation of this combination being able to similarly sensitize cationically photopolymerizable and Oxman et al. establishes that the amine will inherently cause an induction period in cationically photopolymerizable compositions, but afterwards will increase the rate of reaction. As discussed above, the examiner agrees that the resulting composition is less sensitive, but notes that the practical difference in exposure times does not offset the benefit of spectral sensitivity. The lasers disclosed in the prior art are able to perform the exposure in a reasonable time to form a useful holographic article (See Popovich et al. '152), particularly in view of the induction periods of 0.51-3.46 minutes by Oxman et al. caused by the presence of the amine, so the movement of monomer or the like would not be an issue in the combination rendered obvious by the rejection. Further the claims are not limited to the use of particular exposure times or laser powers. In section C.3., the applicant fails to appreciate that EPON SU-8 (see figure 3 and section [0039] of the prepub of the instant specification and cyclohexene oxide (Oxman et al. at 14/24-15/6 and Neckers et al. at 5/17) are both cationically curable epoxies (which are being photocured, so the induction effect ascribed to the addition of the amine would be expected to be realized with the Epoxy resin EPON-SU-8, particularly in view of the epoxy resins disclosed on pages 15-16 of Oxman et al. and the description of the modifiers for these cationically curable materials by Oxman et al. and the description of "epoxy compounds" as the cationically curable materials by Neckers et al. at 5/17 which is broader than just the single example argued by the applicant. The rejection clearly renders obvious the addition the combination of the xanthene dye and co-initiator to the compositions of **either** Campbell, et al., "Fabrication of Photonic Crystals for the Visible Spectrum by Holographic

Lithography, Nature, Vol. 404. pp. 53-56 (03/2000) **or** Turberfield, "Photonic Crystals made by Holographic Lithography, MRS Bull. Pp. 632-636 (08/2001) and the appplicant's attack of these components separately is a piecemeal mode of addressing the rejection as it does not not merely add the co-initiator/modifier.

Section D on pages 15-21 of the brief is understood to correspond to rejection II.

Section D.a.-D.b.. (brief at 15-17 & 9-11)

This section is identical to section C.a.-C.b. addressed above. The examiner relies upon the response above, rather than repeat the response here.

Section D.1. (brief at page 17-18 & 11-12)

This section is identical to section C.1. addressed above. The examiner relies upon the response above, rather than repeat the response here.

Section D.2.-D.4. (brief at page 19-21 & 13-14)

This section is identical to section C.2.-C.4. addressed above. The examiner relies upon the response above, rather than repeat the response here. The examiner agrees that Cowan et al. is cited merely to evidence other lasers emitting in the visible range known in the holographic arts.

(11) Related Proceeding(s) Appendix

For the above reasons, it is believed that the rejections should be sustained.

Respectfully submitted,

Martin J. Angebranndt
Primary Examiner, AU 1756

Conferees:

JENNIFER MICHENER
QUALITY ASSURANCE SPECIALIST

Jennifer Michener
Appeals Specialist, TC 1700

Mark F. Huff
Supervisory Patent Examiner, AU 1756